DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Parts 1910 and 1926

[Docket No. H-033]

Occupational Exposure to Asbestos, Tremolite, Anthophyllite and Actinolite

AGENCY: Occupational Safety and Health Administration, Department of Labor.

ACTION: Final rules; amendment.

SUMMARY: On June 20, 1986 OSHA published revised standards governing occupational exposure to asbestos, tremolite, anthophyllite and actinolite in general industry and construction. In these standards, OSHA reduced the 8-hour time weighted average (TWA) permissible exposure limit (PEL) to 0.2 f/cc. but did not issue a short term exposure limit (STEL) or excursion limit for exposure to these materials. OSHA is now amending these rules by adding an excursion limit of 1 f/cc average over a sampling period of 30 minutes.

The Agency has based this determination on its review of the asbestos rulemaking record using criteria set forth by the Court of Appeals for the District of Columbia Circuit (*Public Citizen Health Research Group* v. *Tyson,* 796 F. 2d 1479 (D.C. Cir., 1986) and *Building and Construction Trades Department, AFL–CIO* v. *Brock,* 838 F. 2d 1258, 1273 (D.C. Cir., 1988)). Based on this review, OSHA has determined that the record supports the issuance of a 1 f/cc excursion limit measured over 30 minutes for all workplaces affected by the revised asbestos standards and is amending the standards to that effect. In addition employers are required to take other protective actions when employee exposures exceed the EL. The evidence and considerations supporting this determination are set out in the supplementary information section of this document.

EFFECTIVE DATE: This final standard will become effective October 14, 1988 except the information collection requirements of 29 CFR 1910.1001 (d)(2), (d)(3), (d)(5), (d)(7), (f)(2), (f)(3)(i), (j)(5), (l), and (m), and 29 CFR 1926.58 (f)(2), (f)(3), (f)(6), (h)(3)(i), (k)(3), (k)(4), (m) and (n) as they apply to the excursion limit which will be submitted to OMB for approval. OSHA will publish a document in the future establishing an effective date for the information collection requirements.

FOR FURTHER INFORMATION CONTACT: Mr. James Foster, OSHA, U.S. Department of Labor, Office of Public Affairs, Room N3647, 200 Constitution Avenue NW., Washington, DC 20210. Telephone (202) 523–8151.

SUPPLEMENTARY INFORMATION:

I. Clearance of Information Collection Requirements

On March 31, 1983, the Office of Management and Budget (OMB) published 5 CFR Part 1320, implementing the information collection provisions of the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 et seq. (48 FR 13666). Part 1320, which became effective on April 30, 1983 and was revised May 10, 1988 **Federal Register,** Vol. 53, No. 90), sets forth procedures for agencies to follow in obtaining OMB clearance for information collection requirements. The sections of this final standard which may create recordkeeping requirements are the following: 29 CFR 1910.1001 (d)(2), (d)(3), (d)(5), (d)(7), (f)(2), (f)(3)(i), (j)(5), (l), and (m), and 29 CFR 1926.58 (f)(2), (f)(3), (f)(6), (h)(3)(i), (k)(3), (k)(4), (m) and (n).

In accordance with the provisions of the Paperwork Reduction Act and the regulations issued pursuant thereto, OSHA certifies that it will be submitting the information collection requirements for the standards under control numbers 1218–0133 and 1218–0134 to OMB for review under section 3504(h) of that Act.

Public reporting burden for this collection of information for General Industry is estimated to average 0.73 hours per response and 0.03 hours per response for the Construction Industry, which includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or and other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Information Management, Department of Labor, Room N–1301, 200 Constitution Avenue., NW., Washington, DC 20210; and to the Office of Information and regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

II. Regulatory and Legal Authority Background

On June 17, 1986, OSHA issued revised standards governing occupational exposure to asbestos, tremolite, anthophyllite and actinolite for general industry and construction (51 FR 22612 *et seq.,* Pub. June 20, 1986). Effective July 21, 1986, the revised standards amended OSHA's previous asbestos standard issued in 1972. The 1972 standard included a 10 f/cc "ceiling" limit as well as a 2 f/cc time weighted average (TWA) permissible exposure limit.

Chief among the revised standards provisions was a tenfold reduction in the TWA PEL to 0.2 f/cc from 2 f/cc. However, although the April 1984 notice of proposed rulemaking stated that OSHA would consider a revised ceiling limit, in the final revised standards OSHA determined not to issue an explicit short term limit (51 FR 22682–3, 22709).

OSHA based this determination on its finding that the rulemaking record consisting of "toxicological and dose-response data failed to show that short-term exposure to asbestos is associated with an independent or greater adverse health effect than is exposure to a corresponding dose spread over an 8-hour day; that is, there is no evidence that exposure to asbestos results in a "dose-rate" effect * * *" OSHA further stated that its decision was "consistent with OSHA's recent policy decision described in the Supplemental Statement of Reasons for the Final Rule for Ethylene Oxide (50 FR 64) in which OSHA established that short term exposure limits for toxic substances are not warranted in the absence of health evidence demonstrating a dose-rate effect (51 FR at 22709)." OSHA's decision to not issue a STEL was challenged in petitions filed in the Court of Appeals for the District of Columbia.

Subsequently, on July 25, 1986, the United States Court of Appeals for the District of Columbia reviewed the ethylene oxide (EtO) standard which OSHA had relied on in its decision to not issue an asbestos EL. It held that OSHA contravened the OSH Act when it failed to issue a short term limit for ethylene oxide based on the Agency's finding that the EtO record did not support a "dose-rate effect." The Court held that the OSH Act compels the Agency to adopt a short term limit if the rulemaking record shows that it would further reduce a significant health risk and is feasible to implement regardless of whether the record supports a "dose-rate" effect (796 F. 2nd at 1505). This decision states that "(B)arring alternative avenues to the same result, OSHA shall set the standard which most adequately assures, to the extent feasible, on the basis of the best available evidence that no employees will suffer material impairment of health. 29 U.S.C. 655 (b)(5) (1982). "(S)ince OSHA has found that a significant health hazard remains even with the (TWA) PEL, the agency must find either that a STEL will have no effect on that risk, or that a STEL is not

feasible, if the Agency declines to impose a short term limit" (796. F. 2nd at 1505).

Because OSHA had relied on the EtO rationale in making its asbestos decision, OSHA decided to reconsider its decision not to issue an excursion limit for asbestos and informed the Court of its intention to reconsider the STEL issue based on the existing record.

The Court issued its decision reviewing the asbestos standards in February 1988 (*B.C.T.D., AFL–CIO* v. *Brock* 838 F. 2d 1258). Therein, the Court noted OSHA's commitment to complete reconsideration of the STEL issue and ordered "that reconsideration be completed within 60 days of the issuance of the mandate in this case, which issued on July 6, 1988.

The Court also reiterated the criteria requiring an agency to adopt a STEL: *viz,* that the measure will result in a further reduction in significant health risk and that it is feasible to implement.

OSHA has reviewed the asbestos rulemaking record in order to apply these criteria. The agency finds that compliance with a short term excursion limit would further reduce a significant health risk remaining after the TWA limit of 0.2 f/cc was imposed. Secondly, the Agency finds that the lowest excursion level which is feasible both to measure and to institute primarily through engineering and work practice controls is 1 fiber per cc measured over 30 minutes. OSHA therefore is imposing this level as an excursion limit to be met by all employers covered by the revised standards. The Agency also is withdrawing its previous determination to not issue an excursion limit or STEL.

OSHA notes that it is adopting the term "excursion limit" to refer to the short term permissible exposure limit established here, so that the terminology used by the American Conference of Governmental Industrial Hygienists (ACGIH) and by OSHA will not conflict. The term "excursion limit" is used by the ACGIH to refer to a limitation on short term exposures which are called for by industrial hygiene considerations, where toxicological data are unavailable. The term "STEL" is used by the American Conference of Governmental Industrial Hygienists (ACGIH) to refer to a short term limit dictated by specific toxicologic or hazard data (ACGIH Threshold Limit Values and Biological Exposure Indices for 1986–1987, 3–5). Because OSHA is not basing the short term permissible limit for asbestos on toxicological data, OSHA instead is using the term "excursion limit" to designate that limit.

The term "ceiling limit" historically was used by OSHA to refer to both a "peak" limit, *ie,* with no duration specified, and to a limit measured over a given time period, such as 30 minutes. Because of this dual usage, the term was imprecise and OSHA believes it should be replaced with "excursion limit."

This preamble, in some places, uses "STEL" and "excursion limit" interchangeably, mostly in quoting from previous discussions to conform to previous usage. The following discussion further explains the reasons for OSHA's decision to adopt an excursion limit of 1 f/cc measured over 30 minutes.

A. The Excursion Limit Chosen Will Further Reduce a Significant Health Risk

OSHA finds that compliance with a reduced excursion limit would further reduce a significant health risk from asbestos exposure which exits after imposing a 0.2 f/cc time-weighted PEL.

OSHA's risk assessment showed that lowering the TWA PEL from 2 f/cc to 0.2 f/cc reduces the asbestos related cancer mortality risk from lifetime exposure from 64 deaths per 1,000 worker to 6.7 deaths per 1,000 workers. OSHA estimated that the incidence of asbestosis would be 5 cases per 1,000 workers exposed for a working lifetime under the TWA PEL of 0.2 f/cc. Counterpart risk figures for 20 years of exposure are excess cancer risks of 4.5 per 1,000 workers and an estimated asbestosis incidence of 2 cases per 1,000 workers.

OSHA's risk assessment also showed the persistence of a significant risk at the 0.1 f/cc action level. The excess cancer risk remaining at that level is a lifetime risk of 3.4 per 1,000 workers and a 20 year exposure risk of 2.3 per 1,000 workers. OSHA concludes therefore that continued exposure to asbestos at the TWA permitted level and action level presents residual risks to employees which are still significant.

Imposing the excursion limit will reduce risk to employees whose asbestos exposure is limited to one or two short term bursts, lasting 30 minutes each. If the periods of exposure are less than 30 minutes then employees with more "bursts" will also have their risk reduced by the excursion limit. The maximum reduction will be felt by employees with non-detectable background asbestos exposures, whose only detectable exposure is a single burst (or bursts) lasting no longer than 30 minutes and which measure no more than 3.2 f/cc (the short term equivalent of the 0.2 f/cc TWA PEL).

To calculate the degree of risk reduction for such employees we note that the 8-hour time-weighted average exposure equivalent of the excursion limit established here is 0.063 f/cc. That is, if a worker is exposed to asbestos at the excursion limit of 1 f/cc for 30 minutes and exposed to no other asbestos for the remainder of the day, the 8 hour TWA exposure would be 0.063 f/cc. This figure is calculated by dividing the excursion limit of 1 f/cc by the number of 30 minute periods in an eight hour work day (16).

The risk assessment methods previously employed in the final asbestos standards (the linear cumulative dose model) can be used to calculate cancer risks for workers exposed only to one burst of asbestos for 30 minutes at the 1 f/cc excursion limit (equivalent to 0.063 f/cc as an 8-hour TWA). Using linear proportionality to previously calculated risks, these predictions are a lifetime (45 year) excess risk of 2.3 per 1,000 workers, and an excess cancer risk for 20 years exposure of 1.5 per 1,000 workers. OSHA believes that these risks are clearly not insignificant. In this case where workers are exposed only to one burst of asbestos per day, asbestos exposure and thus also cancer risk are substantially reduced by 67%. Where additional exposures occur beyond the 30-minute exposure, the reduction in risk is lower than calculated, and conversely, the cancer risk is greater than calculated.

The impact of this reduction will be felt by approximately 35,800 employees estimated by OSHA as having 8-hour TWA exposures below the current 0.2 f/cc PEL but short term exposures which exceed the excursion limit. (See Table 2, infra).

Thus, in accordance with the *Public Citizen* decision, the imposition of an excursion limit will further reduce significant risk remaining under the current standard. OSHA estimates, based on the total estimated affected population, and the risk factors cited, that about 118 lives will be saved based on lifetime exposures and 79 lives based on 20 year exposure because of the imposition of this excursion limit.

OSHA also finds that unregulated short-term exposures to asbestos unnecessarily elevate cumulative exposures even if the time weighted average is below the PEL. Because OSHA has found that significant risks of asbestos-related disease exist at cumulative exposures below the 1986 PEL of 0.2 f/cc, compliance with an excursion limit would further reduce such risks as well (See 51 FR at 26647–8), although these reductions have not been quantified.

The ways the institution of an excursion limit of 1 f/cc over 30 minutes will reduce risks to employees are illustrated by the following examples from the rulemaking record.

In some important operations exposure patterns consist of frequent short term rather that continuous levels of exposure. In the construction industry, asbestos removal and repair of asbestos-containing products are often short-term and generate peak exposures (Ex. 84–474, 84–462). Installation of new construction materials also involves intermittent peak exposures, for example, drilling and sawing pipe and sheet.

When asbestos-cement pipe is installed, cutting and machining of pipe can result in potentially high exposures. A representative of the Association of A/C Pipe Producers (AACPP) recommended work practices involving shrouded tools, which if followed were said to limit peak exposures for 15 minutes to 0.75 f/cc and 8-hour TWA exposures to under 0.1 f/cc (Ex. 91–16).

OSHA believes that the use of shrouded tools on-site will increase because of the adoption of an excursion limit. Where only a small amount of cutting on the construction site is needed, it is possible that a 0.2 f/cc TWA can be attained with unshrouded tools. With a short term excursion limit, the employer is more likely to require and the employee is more likely to use the shrouded tools to ensure compliance. In so doing, the employee's cumulative exposure will be significantly reduced and the risk of developing asbestos related disease will be correspondingly reduced.

In general industry, the largest group of exposed workers, brake repair workers, are subject to peak exposures. Their work can be intermittent and the evidence shows that for workers performing occasional brake repair jobs, their exposures occur in short spurts which can be above 1.0 f/cc, but when averaged over an 8 hour day fall within the permissible TWA limit.

OSHA believes the imposition of an excursion limit will increase the probability that employers will utilize the more effective but not required, work practices to assure compliance with the new excursion limit. OSHA had prohibited one method of cleaning brake linings using compressed air because the evidence showed that using that method likely would exceed the new TWA PEL in almost all cases. Other practices, although discouraged, are not prohibited. The evidence indicated that brushing the asbestos residue from affected parts sometimes exceeded a 1 f/cc excursion limit, although the new time-weighted PEL of 0.2 f/cc might still be met (Exh. 84–263, 90–148). Additional information about practices which will result in lower short-term as well as TWA exposures levels is set out in Appendix F to § 1910.1001. Consequently, safer working conditions will result for the large number of employees performing automotive brake repair operations.

Other general industry employees will benefit from an excursion limit. In secondary manufacturing, especially gasket manufacturing, asbestos operations often are conducted on an intermittent basis (Exh. 235 A). The time-weighted average would mostly be met even with the use of inferior control equipment. Issuance of an excursion limit would require the use of the best available control equipment and would thus reduce the risk of asbestos related disease for secondary manufacturing workers whose TWA exposures were at or below the PEL.

In addition, control of short term exposures will help employers identify and control the sources that result in variable exposures. OSHA notes that an employee's exposure to toxic substances in the workplace varies from day-to-day and varies within the day's work shift. The meaning of day-to-day variability was considered in the promulgation of the 0.2 f/cc, 8-hour TWA PEL (see 51 FR 22652 to 22654).

OSHA recognizes that various factors cause day-to-day variability, including sampling error in the measurement of the airborne asbestos concentrations, changes in work practices, and changes in ventilation due to misapplication or malfunction. OSHA has concluded that the major sources of day-to-day variability can be moderated by diligent employer control (51 FR 22653). In addition, OSHA has specified a sampling and analytical method which would standardize measurement procedures and greatly reduce sampling error. OSHA determined that the 0.2. f/cc PEL is technologically feasible and will not result in an unfair citation to the conscientious employer. The reviewing Court upheld OSHA's findings in these respects.

Based on its analysis, OSHA believes, for industries that manufacture asbestos products, where asbestos is used as part of a continuing process, that the causes of excursions within a day are similar to the causes of day-to-day variability. Changes in work practice and malfunctioning equipment could cause exposure excursions. Break-downs were identified as a major reason for excursions in manufacturing (AIA/NA, P.H. brief III–44). Within-day-variability may also occur in industries where work with asbestos occurs intermittently during the day; the work cycle will result in temporary and high dust concentrations. Poor maintenance and deterioration of ventilation equipment, such as fan belt slippage, clogged filters and system damage can also influence within day variability as the ventilation system copes increasingly less successfully with the high end of the day's distribution of airborne fibers.

OSHA believes that industries that use asbestos on a continuous basis in well controlled processes such as the manufacture of asbestos products, should keep air concentrations from fluctuating greatly; that the 0.2 f/cc TWA PEL will force the use of the best technology and will require that diligent work practices, maintenance procedure and housekeeping be applied. Thus the 1.0 f/cc excursion limit should have minimal impact on these industry sectors and will not require the installation of new equipment and controls. However, OSHA believes that here too, the 1.0 f/cc excursion limit will provide a quantitative measure of the diligence of the applied work practices, maintenance procedures and housekeeping, and thus will have an overall beneficial effect to limit both interday and within-day-variability.

For the foregoing reasons, OSHA believes that imposing an excursion limit will further reduce the significant risk of asbestos related disease remaining after compliance with the TWA PEL of 0.2 f/cc.

B. Feasibility and Costs of Meeting the New Excursion Limit

The second prong of the legal test requiring OSHA to adopt an excursion limit, is that such a limit is feasible to implement, (*Public Citizen*, 796 F.2d at 1505). Because section 6(b)(5) of the Act provides that OSHA may promulgate standards to the extent that they are both economically and technologically feasible, the following discussion explores both aspects of feasibility. This discussion is organized into a summary discussion of technological and economic feasibility for all sectors; a sector by sector operational discussion of technological feasibility, and a discussion of the capability of the OSHA reference method (ORM) to measure the excursion limit.

OSHA finds that the new excursion limit of 1 f/cc measured over ½ hour is technologically feasible for most significant operations in most affected industries using the same engineering and work practice controls that were determined necessary to meet the PEL. OSHA believes also that the additional

cost of the engineering and work practice controls will be minimal. Thus, compliance with the new excursion limit is technologically feasible at minimal additional costs, which are well below the threshold of economic infeasibility. For some operations, OSHA has determined that compliance with the new limit will require respirators. Since these operations in large part are the same which OSHA previously determined will require respiratory protection to meet the time weighted average PEL of 0.2 f/cc in the revised standards, OSHA believes that the cost of the additional respirators will also be minimal. OSHA also believes that the costs of the ancillary provisions triggered by the excursion limit are similarly minimal and feasible for affected industries.

The evidence supporting these determinations consists of data and comments previously discussed and analyzed by OSHA in its Final Economic Impact and Regulatory Flexibility Analysis set out in 51 FR 22650 *et seq.*, and of data in the rulemaking record illustrating historic industry capability to meet the excursion limit. OSHA projects that this capability will improve because the new limit requires optimum use of existing technology.

1. General Industry

As stated above, OSHA finds that the excursion limit is feasible to achieve in most sectors using the same engineering and work practice controls necessary to achieve the time weighted average limit. In some cases, increased attention to maintenance of controls, diligence in their application, and housekeeping will achieve compliance with the excursion limit, when a more relaxed application of the same controls would meet the TWA PEL. The data submitted to the record specifically showing short term exposures indicate that troublesome areas in meeting the new excursion limit in general industry are essentially the same areas as OSHA determined would have difficulty in meeting the TWA limits. Thus data from 1979 showing 60 minute exposures in asbestos cement sheet plants indicated that as with TWA exposures the operations likely to experience compliance difficulty were finishing or sanding operations (Exh. 235A, Table VI) which are unique to A/C sheet. Although these data also imply difficulty for the mixing stage of the sheet process, OSHA notes that it has determined the wet and dry mixing stages for A/C sheet are "virtually the same as the mixing stages of A/C pipe", which was judged capable for reducing exposures to required levels (51 FR 22656).

The relatively poor reported levels in mixing reflect the fact that the A/C sheet industry has lagged behind the pipe industry in using the best available control technology. (See 51 FR 22657.) Pipe-coupling cutoff operations were also judged to have difficulty in meeting the permissible limits (51 FR 22657).

For both the sheet and pipe manufacturing operations, therefore, OSHA believes that only in sheet finishing and pipe coupling should there be problems in feasibility of compliance without respirator use. Because respirator use is likely to be needed to comply with the TWA as well as excursion limit in finishing, OSHA finds the new excursion limit feasible for these industries.

For friction products, since no data was introduced specially relating to short term limits, OSHA analysis essentially turns on its knowledge of the operations constituting the manufacturing of these products. As explained in the preamble to the revised standards, the asbestos friction products include drum brake linings, disc brake linings, disc brake pads, and clutch facings as well as other materials for motion control in industrial applications. As in the A/C sheet industry, troublesome operations needing respirators for compliance may occur in finishing operations, similar to the projections for compliance with the time-weighted average limit (51 FR 22657).

Other primary manufacturing industries, such as gasket and packings, asbestos paper coatings and sealants and asbestos reinforced plastics are expected to have similar capabilities to respond to the new excursion limit. OSHA believes the feasibility analysis for the TWA permissible limits indicates the feasibility of the 1 fiber excursion limit. OSHA notes that its detailed feasibility analysis based on measurements in such sectors for the time weighted average PEL identified sectors where OSHA believed that even in dry mechanical processing, the newly reduced TWA PEL could be met. Thus the agency concluded that the gasket and packings industry could meet the 0.2 f/cc TWA PEL in dry mechanical operations based on data showing levels below 0.2 f/cc; the asbestos paper industry also, on the basis of measurement showing a mean TWA exposure in dry mechanical operations of 0.14 f/cc, was found to be able to meet the TWA PEL of 0.2 f/cc (51 FR 22657–59).

With respect to secondary manufacturing, the Agency noted in the feasibility analysis for the revised standards that in general, receiving and handling primary asbestos products do not pose exposure problems. Compared with the primary processing steps of fiber introduction, mixing, and covering loose fibers, secondary fabrication takes place in a more controllable environment. OSHA had determined that it is feasible for these industries to comply with the 0.2 f/cc TWA PEL in all operations with the exception of some maintenance activities (e.g. repairing or servicing the controls that protect the other workers and a limited number of dry mechanical operations, 51 FR 22660). OSHA believes this judgment applies equally to the new 1 fiber excursion limit.

With respect to ship repair, OSHA has already determined that respirators will be required to comply with the PEL in many jobs because of the problems associated with ship safety rules, confined spaces and nuclear power plants. This imposition of an excursion limit should not result in additional compliance problems for this sector.

12. New Construction

OSHA believes that the new excursion limit of 1 f/cc measured over one-half an hour is feasible for most operations without relying on respirators. OSHA bases this determination on measurement data in the rulemaking record and the feasibility analysis set out in the June, 1986 preamble to the final revised standards.

First, the data on short term exposures in the record, even measurements taken 10 years ago, show that in most new construction activities, the 1 fiber excursion limit is easily compiled with. For example in a 1977 study of operations involving A/C pipe installation, virtually all hour long measurements were well below the new limit. After adjustment to the new 1 fiber limit measured over ½ hour, the only operations which would not be in compliance are cutting of pipe with an abrasive disc saw, and cutting and machining pipe with a doty tool without a shroud and wet methods (Consad final report, table 3.2, (p. 39).

Joe Jackson of the Association of A/C Pipe Producers (AACPP) stated that workers following AACPP's recommended work practices could almost always ensure that they would avoid peak exposures in excess of 0.75 f/cc over 15 minutes, while eight-hour time weighted average exposures would remain at 0.1 f/cc or below (Exhibit 91–16, Section p. 12). OSHA stated that "the

current trend is for more of these activities to be performed by the manufacturer rather than in the field" (51 FR at 22662, citing to Exhibit 333, Sections G, O, Q), and that the potential for these exposures has decreased substantially since the 1977 study upon which he based his conclusions. For those operations which will be continued to be performed in the field the study referenced above and Jackson's testimony support OSHA's conclusion that the use of shrouded and doty tools will result in exposure below the new excursion limit.

For A/C sheet installation, measurement results of more recent studies also indicate that with the use of shrouded tools most operations can comply with the new excursion limit. Thus personal exposure monitoring results from use of a shrouded circular saw and drill on flat A/C sheet resulted in 40 minute exposure levels of 0.1 f/cc, well below the 1.0 fiber excursion limit measured over 30 minutes (cite) and use of a shrouded circulator saw, sabre and drill in a 1979 study for period of under one half hour resulted in measurements no higher than 0.15 f/cc. (Consad Tables 3.3 and 3.4).

Installation of asbestos floor products is an operation which generally results in very low exposures (see e.g. Ex. 84–474). Although certain activities involved in removing old flooring may produce exposures which would exceed the TWA and excursion limits, there appears to be virtually no possibility that the excursion limit would be exceeded if the recommendations of the Resilient Floor Covering Institute were followed. (See, for example Table 3.5 in Consad's report, which indicates that TWA exposures of 2.0 f/cc were measured when dry removal or dry sweeping was performed. However, the Institute would prohibit powersanding and blowing asbestos dust and would require wet sweeping and handling.)

Other operations involving the installation of construction products similarly are expected to have few problems complying with the new excursion limit. The installation of new roofing felts and removal of old asbestos-containing felts, have reported measurements which range from significantly below, to above the TWA permissible limit of 0.2 f/cc. Because the geometric mean concentration, however, is below 0.1 for all activities involved in roofing installation and removal, OSHA believes that the excursion limit will be achievable in most cases. Where based upon circumstances such as the age and condition of the materials removed, the wind, and location of the job, if appears that exposures may exceed this mean, and respiratory protection may be called for to meet both the new excursion limit as well as the PEL.

Installation of asbestos sheet gaskets, on the other hand, should easily meet the new limit without reliance on respirators. Measurement data reporting mostly one-half hour measurements; (the sample ranged from 15 to 95 minutes measurements, with most activities measured up to 37 minutes (Consad, Table 3–8), shows exposures not exceeding 0.39 f/cc measured over 28 minutes. Based on this data, OSHA finds that the new excursion limit is feasible for this sector.

3. Construction, Abatement and Demolition

In the feasibility analysis performed relative to the TWA permissible limit of 0.2 f/cc, OSHA determined that engineering controls cannot routinely reduce exposure below the 0.2 f/cc PEL during major asbestos removal projects and that the supplemental use of respirators may be required. (51 FR 22663). Smaller abatement projects, on the other hand, were judged capable of meeting the TWA limit, because the levels measured over a day's work ranged from less than 0.1 f/cc to 0.57 f/cc with a geometric mean value of 0.09 f/cc (51 FR 22664 citing to 84–74, Table 3.10). Compliance expectations for the new excursion limit are that for major removal projects, respirator usage is expected and employees will be protected against both permissible levels by such equipment. For small projects, such as removal of insulation covering pipes in small areas, glove boxes may be available and can, at least some of the time, result in exposures low enough to meet both the TWA and excursion permissible limits (see 51 FR 22664).

Renovation activities involve asbestos exposure when asbestos materials used for pipe and boiler insulation, fireproofing, drywall tape and spackling, and acoustical plasters are disturbed during renovation projects. OSHA concluded in the feasibility analysis in the revised asbestos standards that "engineering controls are generally effective in limiting exposures after asbestos-containing materials have been disturbed, but that workers who actively disturb these materials will probably require respiratory protection to comply with the 0.2 f/cc PEL." 51 FR 22664.

OSHA's contractor noted that "as in asbestos abatement, exposures in renovation vary tremendously depending on the condition and friability of the asbestos materials, and the nature of the work being performed." (Clayton report, Exh. 3 at 32). Data submitted on the work exposures of renovation workers reflect TWA measurements, not short term levels. However, based on the time weighted average levels reported, OSHA concludes that most renovation workers who are indirectly exposed to asbestos will be protected against the limit by engineering and work practice controls but workers who directly disturb asbestos will need respiratory protection to comply with the new excursion limit, as OSHA similarly concluded with the respect to the TWA PEL.

Maintenance workers will not need respiratory protection for compliance with the new excursion limit in most situations. OSHA bases this determination on limited record data which shows concentrations during routine maintenance activities in a building in which serious deterioration of the asbestos materials had occurred and which appear to be short-term peak measurements. (Clayton report, Exh. 3 at 33).

These measurements ranged from 0.02 to 1.4 f/cc. Because these measurements appear to be a worst case situation, OSHA believes that engineering and work practice controls will adequately control exposures during routine maintenance activities within the new excursion limit of 1 f/cc measured over one-half hour.

III. Regulatory Analysis

Executive Order 12291 (46 FR 13197, Feb. 19, 1981) requires that a regulatory analysis be conducted for any rule having major economic consequences. OSHA has analyzed the economic consequences of the asbestos standards as promulgated in 1986 at that time. The further analysis required for these revisions follows.

A. Population-At-Risk and Benefits

As part of this analysis, OSHA estimates that, under the current asbestos rule, at least 36,000 workers in general industry and construction remain unprotected from asbestos fiber levels above the 1 f/cc excursion limit. For general industry, about one-tenth of the workers within plant operations with 8-hour TWA exposures of between 0.1 and 0.2 f/cc may exceed the excursion limit for thirty minutes a day. This fraction was applied to the sectoral exposure data reported in the Asbestos Regulatory Impact Analysis (RIA) [App. G] to yield OSHA's estimate of 2,703 workers affected by the excursion limit in general industry.

In automotive repair, approximately five percent of the population at risk to asbestos fibers are estimated to exceed the excursion limit. Hence, of the 527,000 workers exposed to asbestos in this sector, approximately 26,000 face thirty-minute exposures above 1 f/cc. In its RIA, OSHA estimated the costs and benefits of using solvent spray on brake-repair work in all affected establishments under the assumption that all firms would find it cost-effective to keep exposures below the action level by using the solvents on all repair jobs. OSHA now believes that some establishments are able to comply with the current standard without excursion-level controls and that the costs and benefits estimated for this industry sector in the RIA were too high.

To comply with the proposed excursion limit provisions, these brake-repair establishments would now be required to use the solvent spray, thereby ensuring protection of the total population-at-risk in the sector. Assuming workers affected by the excursion limit perform one two-hour brake job per day—during which peak exposures—OSHA estimates that use of the spray will reduce 8-hour TWA exposures from around 0.13 f/cc to 0.06 f/cc (Ex. 84–263). Based on the mortality rates for asbestos exposure given in the RIA, OSHA estimates that, in brake repair, approximately 3 of the 39 avoided fatalities that were estimated in the RIA should be assigned to the benefits of the proposed excursion limit standard.

In ship repair, OSHA assumed that all workers were provided vacuum cleaners and air-purifying respirators for the purpose of reducing TWA exposures. This equipment carries protection factors ranging from 10 to 1,000 and therefore would also protect employees from high excursion levels (see Asbestos RIA, Tables G–16 and G–18). For this reason, OSHA projects that few ship repair workers are exposed above the excursion limit.

In new construction, only asbestos/cement pipe installers are expected to be currently exposed to high excursion levels at frequent intervals. The estimated 16,000 workers involved in a/c pipe installation can be divided into 3,200 crews (five per crew). In the absence of controls, high fiber exposures can occur during the machining and cutting of pipe prior to installation. Employers experiencing excursion-level exposures can use shrouded tools during these activities to comply with paragraph (g)(2)(i) in the asbestos construction standard. Given the trend to have most of the machining done by the fabricator, and given the expense of purchasing shrouded tools, it is anticipated that only one-third of the crews will cut pipe at the worksite. Therefore, assuming one person on each crew is involved in cutting pipe, the population at risk in a/c pipe installation is expected to be around 1,100.

During most asbestos abatement, demolition and renovation jobs, the use of engineering controls and respirators to meet the TWA PEL will also reduce exposures to below the excursion limit (see Asbestos RIA, Table G–20). OSHA anticipates that the excursion level will be exceeded only during occasional small-scale jobs, where these controls are not needed to meet the TWA PEL. Similarly, in two activities within new construction, a/c sheet installation and asbestos roofing installation, the use of shrouded tools, vacuums, clothing and respirators needed to meet the TWA PEL are expected to prevent exposure levels from exceeding the excursion limit in all but a few short-duration activities. Thus, some minor, non-quantifiable benefits are expected in these sectors once the existing engineering controls and respirators are applied in the small jobs.

The overall population at risk from exceeding the excursion limit in construction maintenance is estimated at 32,000. In commercial/residential building maintenance, approximately 90,000 workers in small-scale jobs are potentially exposed to asbestos (RIA, p. F–20). However, OSHA believes that only about ten percent of these workers will be routinely exposed to asbestos. Thus, OSHA estimates that approximately 10,000 employees, working in two-person crews, will specialize in small-scale repair and renovation work involving contact with asbestos. In routine maintenance for general industry, of the approximately 220,000 workers exposed to asbestos and not equipped with respirators, an estimated ten percent, or 22,000, are assumed to be exposed to levels above the excursion limit.

Thus, the overall population at risk to exposures above the excursion limit is expected to be approximately 36,000 workers (not counting the population at risk in automotive repair). In the construction maintenance sectors affected by the standard, exposures are not expected to occur on a daily basis. For the purpose of estimating the incremental benefits of an excursion limit, the population at risk must be expressed as the number of full-time equivalent workers. Accordingly, OSHA estimates that the 36,000 workers with some exposures above the excursion limit translate to the equivalent of 10,000 full-time employees.

To develop a quantitative estimate of the expected incremental benefits of an excursion limit, OSHA conservatively assumes that the use of engineering controls, respirators and other measures will reduce 8-hour exposure levels by a factor of ten. Table 1 shows the number of expected cancer deaths for each sector at 0.13 f/cc TWA—estimated as the current mean exposure level for all industry establishments impacted by the excursion limit—and .013 f/cc TWA, the level after the tenfold exposure reduction. For each exposure level the number of expected deaths in manufacturing and construction is summed. Taking the difference of these two sums yields the figure for avoided cancer deaths. As indicated in the table, OSHA's risk assessment model predicts that an excursion limit of 1 f/cc for thirty minutes will prevent approximately two cancer fatalities per year in the indicated sectors (not counting the benefits in automotive repair discussed above).

TABLE 1.—ESTIMATED EXCESS CANCER DEATHS AVOIDED DUE TO PROMULGATION OF A THIRTY-MINUTE EXCURSION LIMIT OF 1/FCC FOR ONE YEAR [a]

Sector	No. of full-time equivalent workers	Expected cancer death at .13f/cc TWA [b]	Expected cancer deaths at .013 f/cc TWA [c]	No. of cancer deaths avoided
Primary manufacturing	784	0.152	0.016	0.136
Secondary manufacturing	1,919	0.368	0.037	0.331
Construction	6,980	1,340	0.133	1.207